“Net-Ready” CBRN Sensors – A Way Forward…

Presented to: 2006 Net-Ready Sensors Workshop

Joshua Pressnell (CTR)
JPEO-CBD SSA
Lead Software/Systems Engineer
951.565.0400
pressnel@spawar.navy.mil

Outline

- What is “net-ready”?
  - To the Warfighter…
  - To the Engineers…
  - To the “10 year olds”…
- Key Assertions
- Desired Capabilities
  - General
  - Data and Service Standards
  - Embedded Reusable Modular Components
- JPEO-CBD Net-Ready Sensor Efforts
  - Common Net-Centric RFP and Contracts Language
  - JCID-on-a-Chip
  - “Holster”
- Conclusion

What is “Net-Ready”?

Net-Centricity* is a transformation enabler that empowers all users with the ability to easily discover, access, integrate, correlate and fuse data/information that support their mission objectives.

Systems exchange common data through a set of common services and interfaces which allow for flexible and dynamic specification of data producers and consumers and data routing (i.e.: Scales easily)*

* JFCOM/J8 – Joint Interoperability & Integration / C2 FCB

What is “Net-Ready”?
To the Warfighter…

What is "Net-Ready"?
To the Warfighter…

- **Easily find, access, update, and share information resources relevant to their Area of Responsibility (AOR) and tasking**
- **Quickly deploy assets that have an information component to them with minimal setup and configuration expertise required**
- **Easily access wired / wireless connected sensors**
- **Dismount and carry forward handheld sensors that remain connected to the network (wirelessly)**
- **Sensor data seamlessly integrates with my C2 platform**
- **Plug and Play (PnP)**

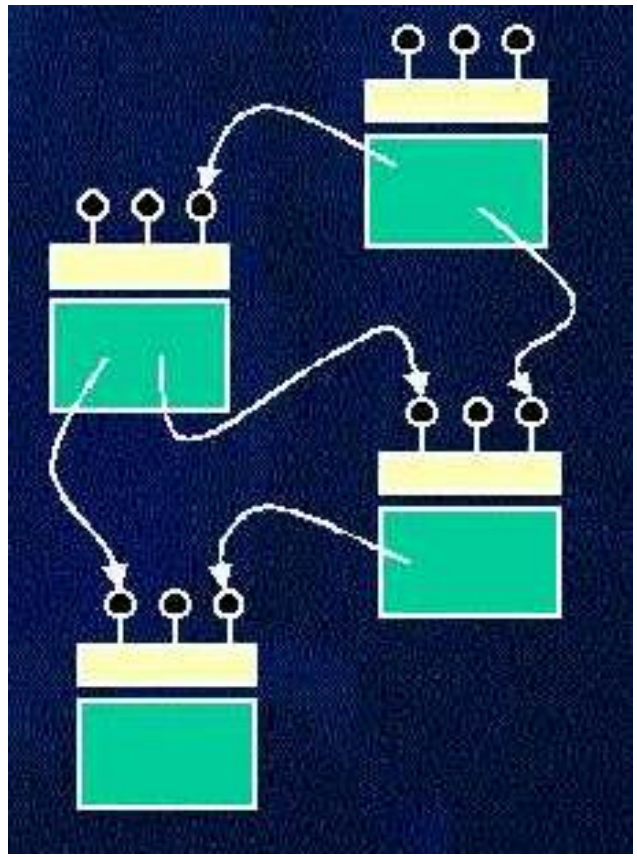
"Even my 10 year old knows what net-centric is…" and practices it…!!!

What is “Net-Ready”?

To the Engineers…

What is "Net-Ready"?
To the Engineers…

- Common software services that are based on a common data model, common schema, and common protocol
  - Sensor data is already in the format expected and can be readily stored in my host database and/or pushed to decision support systems
  - Data Integration becomes XSLT translation between schemas, vice programming
- Modular, reusable, domain independent software components
  - Common software driver reused for all new sensors for sending / receiving sensor data
  - More configuration and less new development



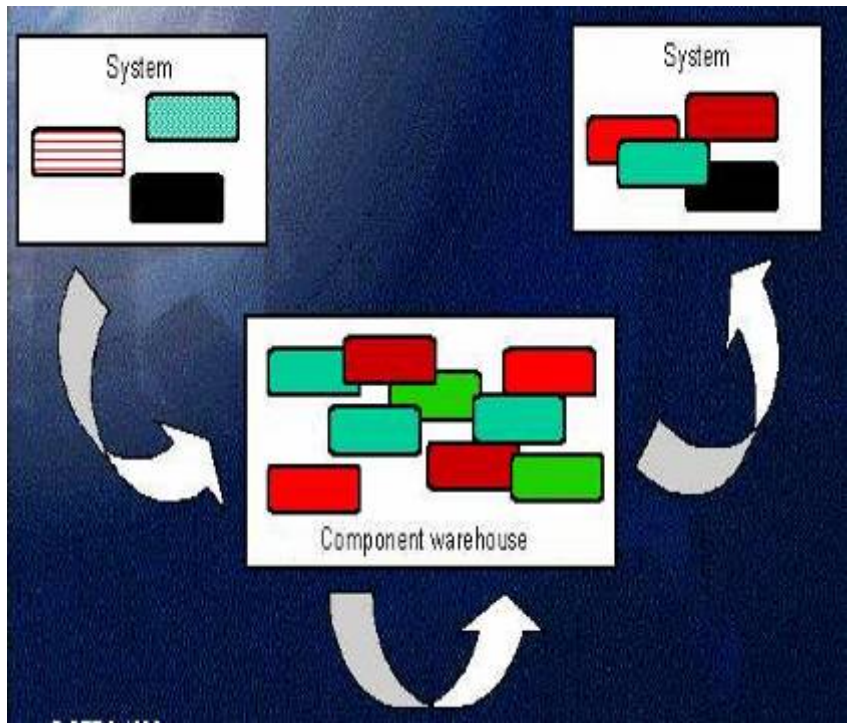
***More** upgrade, configuration, and component provisioning…*

***Less** new development… **Modularity** and **Reuse** are key.*

What is "Net-Ready"?
To the Engineers…

Component configuration and deployment and dynamic software load provisioning to well defined interfaces:

- Component upgrade and component level integration
- PnP components provisioned based on environment (wired, wireless, bandwidth restrictions (specification of common binary compression/decompression techniques), modifiable encryption/decryption, operational vice service/maintenance)



Late binding… distributed interaction… assembly vice development…

Plug-n-Play on-the-go!

What is "Net-Ready"?

To the 10-Year Old…

"Google" Anything I Want!!!

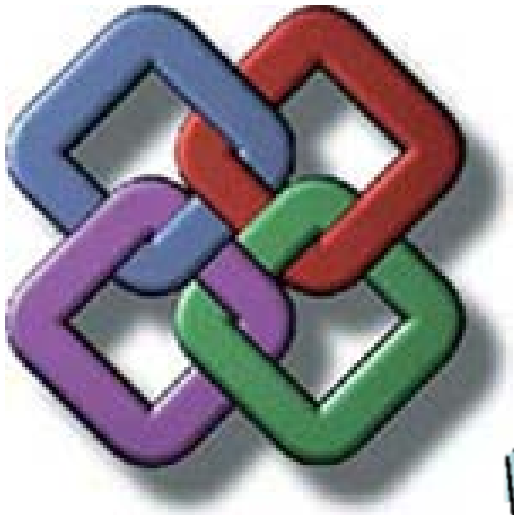
On Line Gaming!

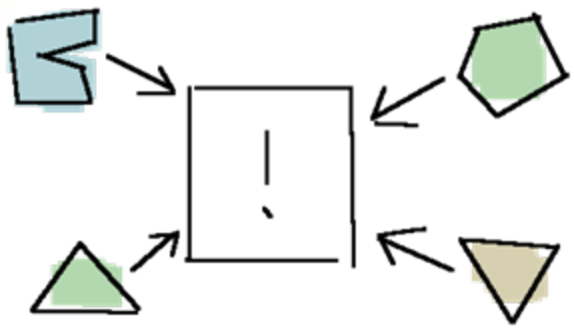
Play With My Friends Anywhere / Anytime - Online!

What is "Net-Ready"?
To the 10-Year Old…

- Discover who is on line… chat with my friends… share information with my friends – use their toys and let them use mine… all on-line…
  - *robust inexpensive real-time distributed collaboration and resource sharing…*
- Online gaming – discover game servers and other gamers and start seeing them and their actions/status on my display and have them see my actions/status on theirs…
  - *distributed situational awareness engagement applications…*
- Wireless on the go is a way of life now – my cell phone, my PDA, my IPOD (look, I'm "Podcasting"!) and dock it when I'm at home
  - *same components used on the move or docked at home*
- PnP peripherals – I want to connect something new so I buy it and plug it in and use it
  - *Plug it in, load the driver, configure the device, get the data…*

Key Requirements





Key Assertions

- **For net-centric sensors to be successful, the standards must be widely accepted. To enable such wide acceptance, the standards used for these services and the technologies that implement those standards should meet the following criteria:***
  - **A sensor should be able to service requests from any client regardless of the platform on which the client is implemented***
  - **A client should be able to find and use any sensor regardless of the service's implementation details or the platform on which it runs***

**** Derived from Designing Web Services with the J2EE 1.4 Platform - Overview of Web Service Standards.***

Desired Capabilities - General

- Software defined sensor platform that exploits network connectivity to perform its mission in support of diverse Warfighter needs
- Directly supports and encapsulates the DoD net-centric strategy
- Scaleable PnP architecture securely operable over the Internet
- Immediate integration into system and common operational picture by the Warfighter, not a developer / integrator
- Mounts on vehicles and plugs into existing network… dismounts and forward deploys, remaining wirelessly connected – common embedded and docking platform across all DoD CBRN sensors

Desired Capabilities

Out of the box, should be seen on the network as a discoverable web-enabled service

- light weight web-server available on sensor to access/configure
- allows URL / network configuration for streaming data or WSDL exposed for applications to pull data
- allows configuration of xmit of any/all available data fields and period of transmission
- Supports remote HTTP(S) administration and provisioning and repurposing of sensor data and software
- Allows configuration (just like most $30 routers) such that email address(es) can be specified for log dumps, providing notification / request for service, or quality of service issues, or denial of service attacks

Desired Capabilities - Data and Service Standards

- CBRN sensors will be accessible via W3C open web-service standards, and comply with all information assurance requirements, and communicate utilizing (and updating as necessary) the CBRN XML schema.
- Standardization of the interfaces across all CBRN sensors/devices (status and commands) which will feed CBRN information systems and incorporation of that into the CBRN Data Model

All CBRN sensor data that can be transmitted, received, and stored will use the CBRN Data Model as the basis for data representation!

Desired Capabilities - Data and Service Standards

Non-proprietary interface that accepts and generates XML to a well-formed schema

- For JPEO-CBD developed sensors, this is the CBRN XML Schema
- For commercial developers:
  - If the commercial sensor interface supplies a schema, then we write an XSLT (at a minimum) to map data from sensor vendor schema to CBRN XML Schema (ability to download an XSLT to the senor preferred)
  - If the commercial sensor interface does not support a well-formed schema, then we will have to write a driver to their vendor supplied interface and then convert that data into a CBRN XML Schema representation *(this is the case we want to avoid at all costs and is a last resort… it's where we are today)*

Starting with common standards in S&T makes it much easier to evaluate new technology and transition it into programs of record.

Desired Capabilities - Embedded Reusable IT Platform

- For those familiar with the JWARN JCID… we want "JCID on a chip", embedded into all future CBRN sensors…
  - embed a smart network interface component into sensors
  - same IT platform can be shared across CBRN sensors
  - Supports mate-able or embedded RF capability
- Embeds common core services that support management operations over-the-net supporting:
  - in-the-field reconfiguration
  - dynamic repurposing
  - and over-the-net data maintenance and analysis

Desired Capabilities - Modular Components

- Completely abstract the “GIG” interface component from the rest of the sensor platform
  - Reuse the infrastructure (software, embedded network cards, etc.)
  - Sensor vendors focus on CBRN “sensing” (detection and identification) and reuse components that provide data availability, sensor services, and security models
- Common software drivers to communicate with devices and code/decode their data to/from the extensions that would be made to the CBRN COI XML Schema
- Performance - ability to “plug-in” compression / decompression on a byte stream (XML). Hooks available that allow us to download new modules that can change how that compression / decompression is performed (or not) based on bandwidth / environment

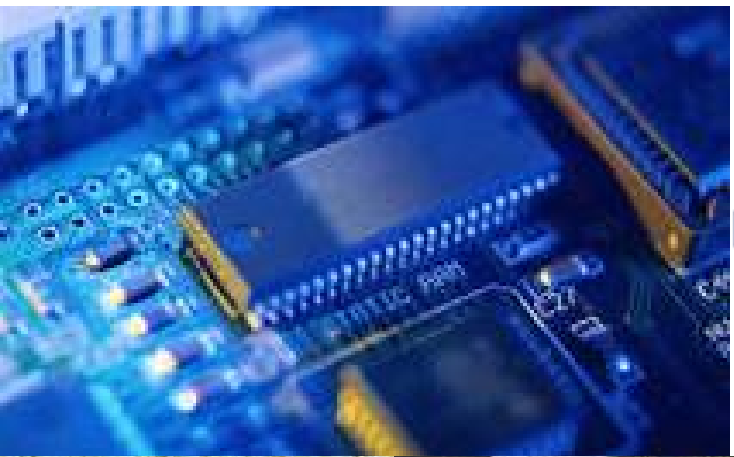
Desired Capabilities - Modular Components

Information Assurance

- Ability to “plug-in” encryption / decryption on a byte stream (XML). Hooks available that allow us to download new modules that can change how that encryption / decryption is performed (or not) based on bandwidth / environment
- Ability to “plug-in” “XML Software Based Guards” into the sensor – hooks available to send / receive data cross-domain
- Encapsulates embedded information assurance framework that contains critical security related software that can be leveraged by all platforms without each of them having to worry about the IA details (abstracted security layer between the software and all ports, protocols, registry settings, network access)

Encapsulate and reuse accredited IA modules!

JPEO-CBD Net Ready Sensor Efforts









Common Net-Ready RFP and Contracts Language

- **A Common Specification For Future JPEO-CBD Programs**
  - **Enterprise Architecture**
    - **Requirements for a common DoDAF representation**
    - **Specifies architecture decomposition expectations**
    - **Requires standards certifications**
  - **Data Implementation**
    - **Requires CBRN Data Model compliance**
    - **Requires meta-data tagging of all data to DDMS standards**
  - **Enterprise Capabilities**
    - **Requires a Service Oriented Architecture and Web Services implementation**
    - **Requires Plug and Play and Discoverability features**
  - **Security**
    - **Requires DoD Information Assurance certifications**

JCID on a Chip

- **A Modular Approach To Meet The Common Net-Centric RFP And Contracts Language**
  - **Small Footprint**
    - **Could be small board, chip, or even pure software**
    - **Emphasis is on reusable modular building blocks for net-centric sensors**
  - **Implements Common Net-Centric Requirements**
    - **Service Oriented Architecture**
    - **CBRN Data Model Compliant**
    - **Sensor-Generic Sensor Data Protocol**
    - **Information Assurance**
  - **Reusable Communications Component**
    - **Combined with legacy sensors to net-enable them**
    - **In future, JoaC will be embedded in JPEO-CBD sensors to make sensors net-ready and plug-and-play out of the box**
  - **Configurable Communications**
    - **Hardware to support wired or wireless communications**
    - **Upgradeable firmware**

"Holster"

- **Modular Dismountable Plug-and-Play Sensors**
  - **Utilizes JCID-on-a-Chip**
    - **JoaC used to provide common modular communications**
  - **Common Physical Standards**
    - **Specifies common physical interface and connections**
    - **Retrofit legacy sensors**
    - **Provides common interface and connections as requirements for future sensors**
  - **Dismountable**
    - **Sensors can be removed from the common "Holster" mounting and carried forward by the operator**
    - **Communications automatically switches from wired to wireless**
    - **Power automatically switches from charge to battery**
    - **Sensor maintains communications with the docking station and continues to report alarms and status to the base station**
  - **Plug-and-Play**
    - **Allows CBRN sensors of various types to share the same common interface specifications**
    - **Any type of sensor can plug in and be seen on the network**

Conclusion - Example

Adding a CBRN Sensor to the Network Should be NO HARDER THAN adding a wireless network printer:

- Buy printer
- Power on printer
- Put CD in my computer
- Load printer driver
- Automatically discover new printer
- Start printing… in less than 15 minutes after opening the box!

- Printer status and control automatically integrate into my host platform printer service manager
- From any where I have access to the network, I can get printer status, print, reconfigure the printer, and update software on that printer that provides new capabilities…

The "network components" are cheap, small, flexible, and available… and, they need to be reused and encapsulated in CBRN sensors!

Conclusion

An average 10-year old should be able to connect / configure / use CBRN sensors… and the steps for connecting to the network and "going mobile" should be identical across CBRN sensors!